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ABSTRACT

Forty-five job descriptions relating to the cable television industry are stated in terms of duties and responsibilities, experience, requirements, and educational requirements in order to lessen the wide disparity within the industry concerning requirements for engineering, technical, and owner/operator work. The job descriptions are not offered as proposed industry standards but as a step toward developing such standards. Graphical summaries are included. (MS)

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CABLE TELEVISION MANPOWER: JOB DESCRIPTIONS AND EDUCATIONAL REQUIREMENTS

U.S. DEPARTMENT OF HEALTH,
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U.S. DEPARTMENT OF COMMERCE/Office of Telecommunications

CABLE TELEVISION MANPOWER: JOB DESCRIPTIONS AND EDUCATIONAL REQUIREMENTS

Edward J. Roth

Introduction by
Robert S. Powers



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<p>This report contains forty-five descriptions for technical positions in the cable television industry. They were prepared in the course of a study of cable television manpower needs conducted by Edward J. Roth, acting as a consultant to the Office of Telecommunications, U. S. Department of Commerce. The study was performed with the cooperation of the National Cable Television Association, the Institute of Electrical and Electronics Engineers, Inc., the American Institute of Aeronautics and Astronautics, the National Society of Professional Engineers, and the Electronic Industries Association. It was found that there are no widely accepted job descriptions for technical positions in either the cable systems owner/operator, the system construction, or the cable equipment manufacturing segments of the cable television industry. The job descriptions in this document were drafted for discussion by all segments of the cable television industry, as a possible step toward development of generally accepted job criteria.</p>			
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INTRODUCTION

by

Robert S. Powers*

During a period as a consultant to the Office of Telecommunications, U. S. Department of Commerce, Edward J. Roth conducted a study to estimate the demand for technical and engineering personnel in the cable television industry. The time period covered was mid-1972 through calendar year 1977. The study was performed between June and October, 1972, with the assistance and cooperation of the National Cable Television Association, the Institute of Electrical and Electronics Engineers, Inc., the American Institute of Aeronautics and Astronautics, the National Society of Professional Engineers, and the Electronic Industries Association. The manpower demand was estimated by means of a survey of 2,612 cable television system owner/operators, 100 cable television equipment and cable manufacturers, and 100 cable television system construction companies.

It immediately became evident that there are no widely accepted job descriptions for technical positions in any of the segments of the cable television industry. Many companies have no written job descriptions. Some others, especially

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in the construction and manufacturing segments, do have such written descriptions, but they are designed for internal purposes only.

In addition, there is a wide disparity in the industry concerning the educational and experience requirements for engineering and technical work. One major multiple system operator summed up his views with the comment that his company has no need for graduate engineers, and on his large staff he has none. Another offered the view that such lack of attention to the educational background and training of engineers is detrimental to the cable industry. Both of these divergent comments were echoed by other system operators during the manpower study.

The job descriptions in this report were drafted prior to the survey, but were not circulated with the questionnaire. They are only "first drafts." They are not proposed as industry standards, but are made available as a step toward developing such standards to the extent they are desired by the industry. The job descriptions have, for example, been submitted to the National Cable Television Association for consideration by the NCTA Engineering Advisory Committee.

The report contains 45 draft job descriptions; eight appropriate to cable system owner/operators, nineteen for cable system construction firms, and eighteen for cable and cable television equipment manufacturing companies. Thirty-

nine other job titles were encountered during the manpower survey, but they occurred so seldom that they are not discussed here.

None of the job descriptions are completely original documents. All were created from job specifications now in use by various companies, from suggestions from the engineering staff of the National Cable Television Association (NCTA), from suggestions of employees of companies participating in the survey, and from comments of others concerned with the problem. Particular thanks are due to the following individuals, who contributed above and beyond the material asked for in the survey: Delmer Ports (NCTA), Ken Simons (Jerrold Electronics Corporation), Frank Baxter (General Electric Cablevision Corporation), Roger Wilson (TelePrompter Corporation), Nate Levine (Sammons Communications, Inc.), Reva Melnicker (Sterling Manhattan Cable TV), Robert Gruno (Burnup & Sims, Inc.), and John Pranke (Theta-Com Corporation).

One of the questions in the survey questionnaire sought the views of the respondents on the type and amount of training they felt necessary for each job. The question was followed by a list of specific job titles appropriate to the respondent's type of company (i.e., owner/operator, construction, or manufacturer). Each job title was in turn followed by either three or five categories of education and experience, depending

on the nature of the specific job. (The electrical engineering training categories were not included in those instances for which a graduate E.E. was not deemed appropriate.) The job titles were selected from lists supplied by companies in each of the three industry segments, and are believed to be the most generally used job titles. The question was submitted as follows:

"Below are listed a series of job titles plus five different categories of electrical or electronic background and experience. Assume you were to employ a man from each category for each of these jobs. This man has no experience in the CATV industry. In your view how long would it take to train each man to a point where he could function effectively in each of these jobs?

<u>Job Title</u> (e.g., "Regional Supervisor")	<u>6 wks.</u>	<u>6 mos.</u>	<u>1 yr.</u>	<u>More than one year, specify</u>
EE plus five years experience	_____	_____	_____	_____
EE, no experience	_____	_____	_____	_____
2-4 years technology graduate	_____	_____	_____	_____
High school plus four years technical experience	_____	_____	_____	_____
High school, no technical experience	_____	_____	_____	_____ "

In this report responses to these questions are given immediately following the corresponding job description. In the case of the cable system owner/operator segment of the industry, from which 448 responses were received in time to be included in the analysis, the responses are summarized in the form of graphs. Since only ten responses were received from each of the other two industry segments, graphical summaries are less appropriate. In those cases, only the tabulated responses are included.

For the graphical summaries, the number of respondents who would require a given period of additional cable television training is shown, for each time period. Thus, the summary for Regional Supervisors (page 9) shows that 138 respondents felt that a graduate electrical engineer with five years of experience would require six months in cable television before he could function as a Regional Supervisor. Only 69 felt that such an engineer would require a full year in the cable industry.

The "more than one year" time periods given in the graphs are the average of the periods specified by those respondents who would require more than a year in the cable industry.

Likewise, in the tabular summaries the "more than one year" periods given are the approximate averages of the periods specified by the respondents.

Another item in the questionnaire concerned the nature of the training required to make a person fully qualified for cable industry jobs, starting with the various levels of education and experience given above. The question asked for the relative amounts of classroom and on-the-job training which would be preferred by the respondent. The responses were generally independent of the particular job being considered, but did vary from one segment of the industry to another. The cable system owner/operators felt that about 20% of the additional training should be in the classroom; the construction segment preferred about 40% in the classroom; and the manufacturing segment suggested only about 6% of this additional training should be in the classroom.

JOB DESCRIPTIONS
AND
EDUCATIONAL REQUIREMENTS

CABLE SYSTEMS OWNER/OPERATOR

REGIONAL SUPERVISOR

Duties & Responsibilities:

This position is usually found in multiple system operations. The Regional Supervisor has profit and loss responsibilities. It is his ultimate responsibility to ensure that each system in his region receives optimum service. He will assist senior management in the development of systems extension and will generally oversee all technical manpower in each system. He will be responsible for technical manpower adherence to systems standards for the operation and maintenance of the system. He will evaluate and contract with suppliers for technical material and equipment. He will establish, with senior management, effective expense controls.

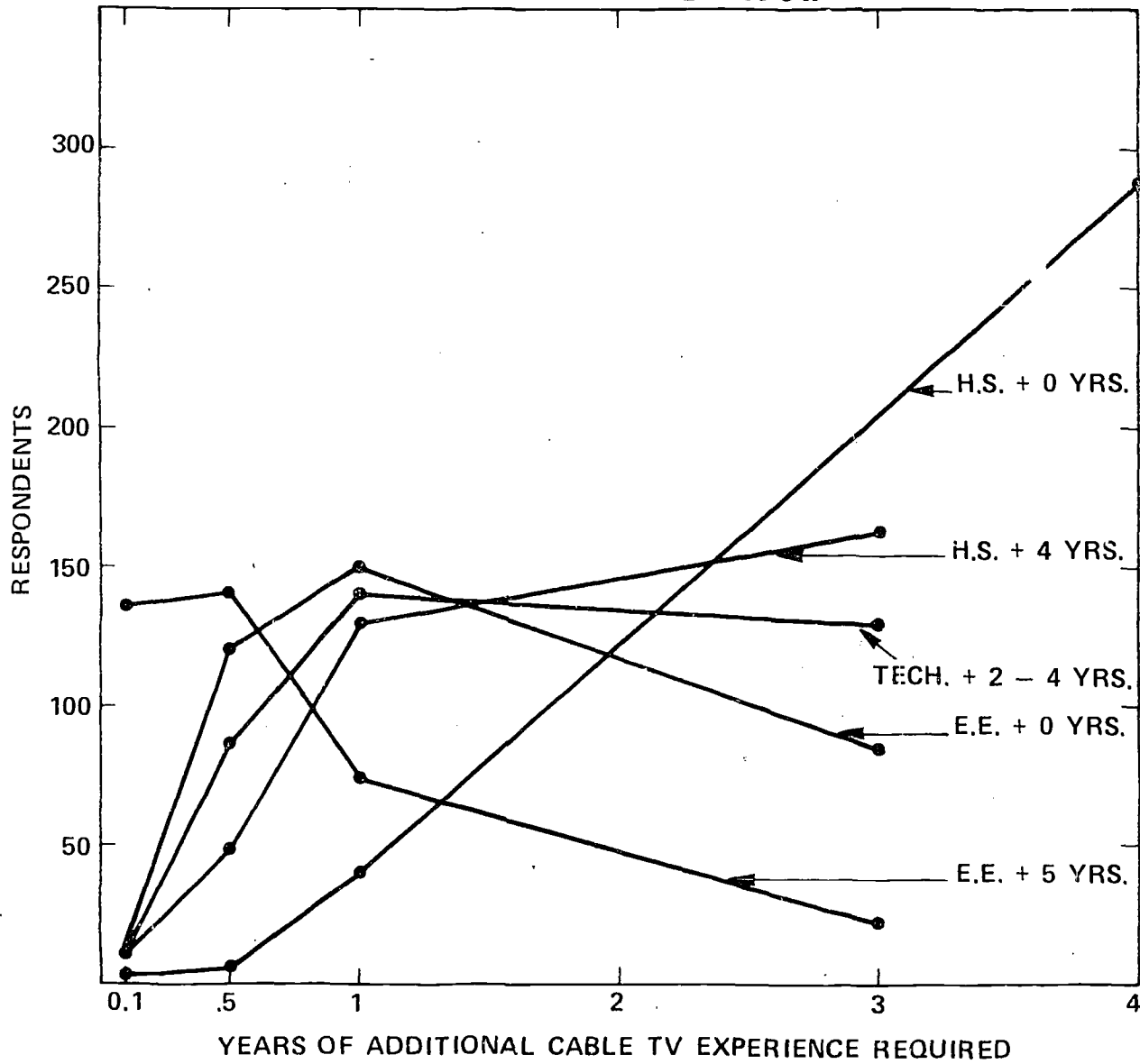
Experience Requirements:

A minimum of 10-12 years experience in administration of technical projects. At least 7 years experience in CATV involving positions of progressive importance. Previous experience as Chief Engineer considered very helpful. Must know FCC, state and municipal governments' rules and regulations as they apply to various CATV systems.

Educational Requirements:

An E.E. degree, or higher, from a recognized college is a prerequisite.

REGIONAL SUPERVISOR



SUMMARY OF RESPONSES
REGIONAL SUPERVISOR

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.	136	138	69	22 (3 years)
E.E.+NO EXPERIENCE	10	120	150	84 (3 years)
TECH.GRAD.+2-4 YRS.	7	85	140	129 (3 years)
H.S.+4 YRS.	8	49	133	168 (3 years)
H.S.+NO EXPERIENCE	2	4	43	282 (4 years)

CABLE SYSTEMS OWNER/OPERATOR

SYSTEM (FACILITY) ENGINEER

Duties & Responsibilities:

Will know how to test and repair facilities, involving use of various pieces of equipment. Will be capable of head-end and systems maintenance. Will know all technical configurations of a system and be able to maintain it and to direct others in various maintenance chores.

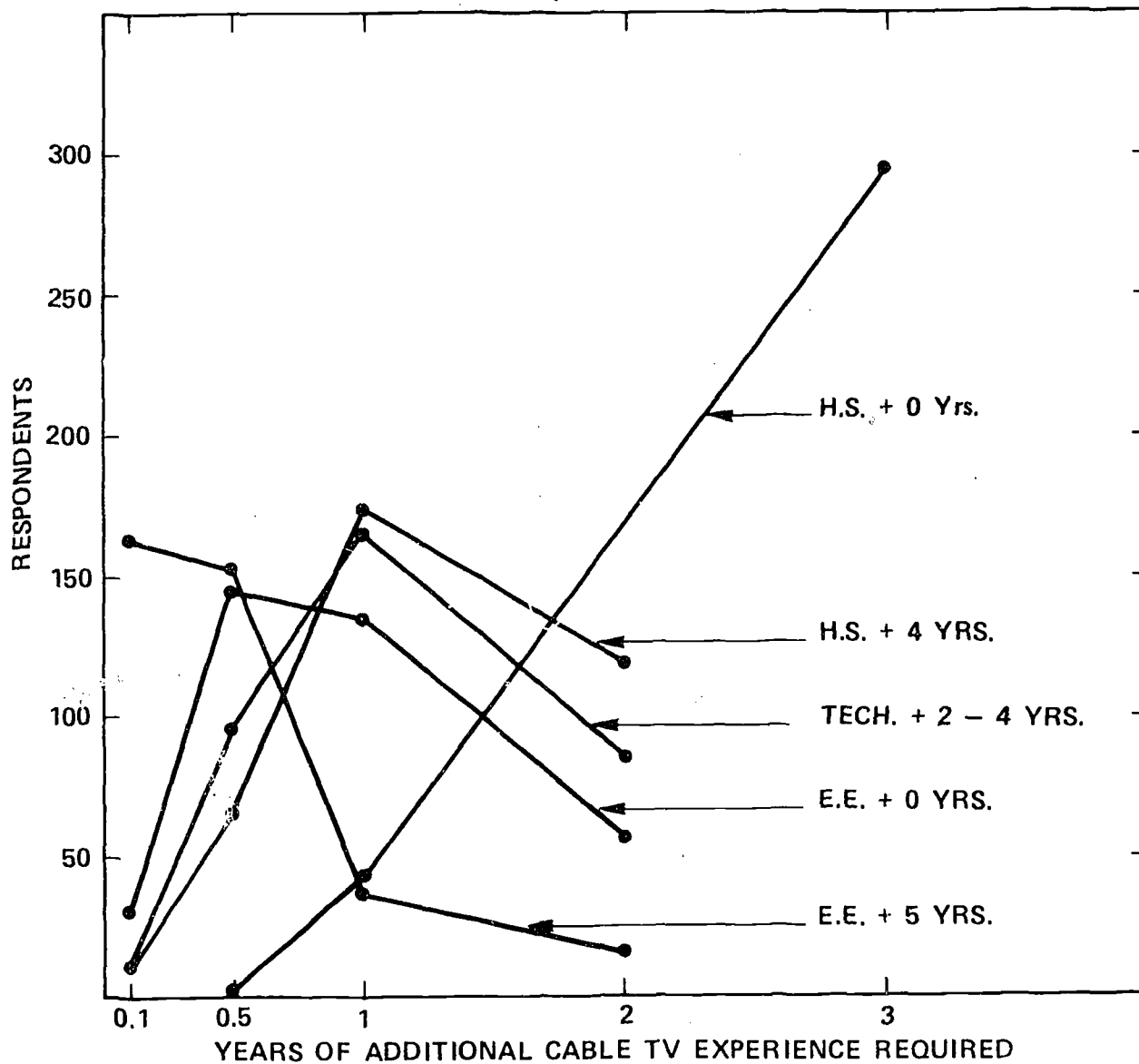
Experience Requirements:

Should have several years of experience in CATV and know systems construction and maintenance. Will know electronics testing and have a good knowledge of the theory of electronics.

Educational Requirements:

High school required. Some additional technical training is desired.

SYSTEM (FACILITY) ENGINEER



SUMMARY OF RESPONSES
SYSTEM (FACILITY) ENGINEER

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.	162	152	38	16 (2 years)
E.E.+NO EXPERIENCE	29	147	135	57 (2 years)
TECH.GRAD.+2-4 YRS.	8	98	167	85 (2 years)
H.S.+4 YRS.	6	65	170	119 (2 years)
H.S.+NO EXPERIENCE	1	2	45	293 (3 years)

CABLE SYSTEMS OWNER/OPERATOR

PLANT SUPERVISOR

Duties & Responsibilities:

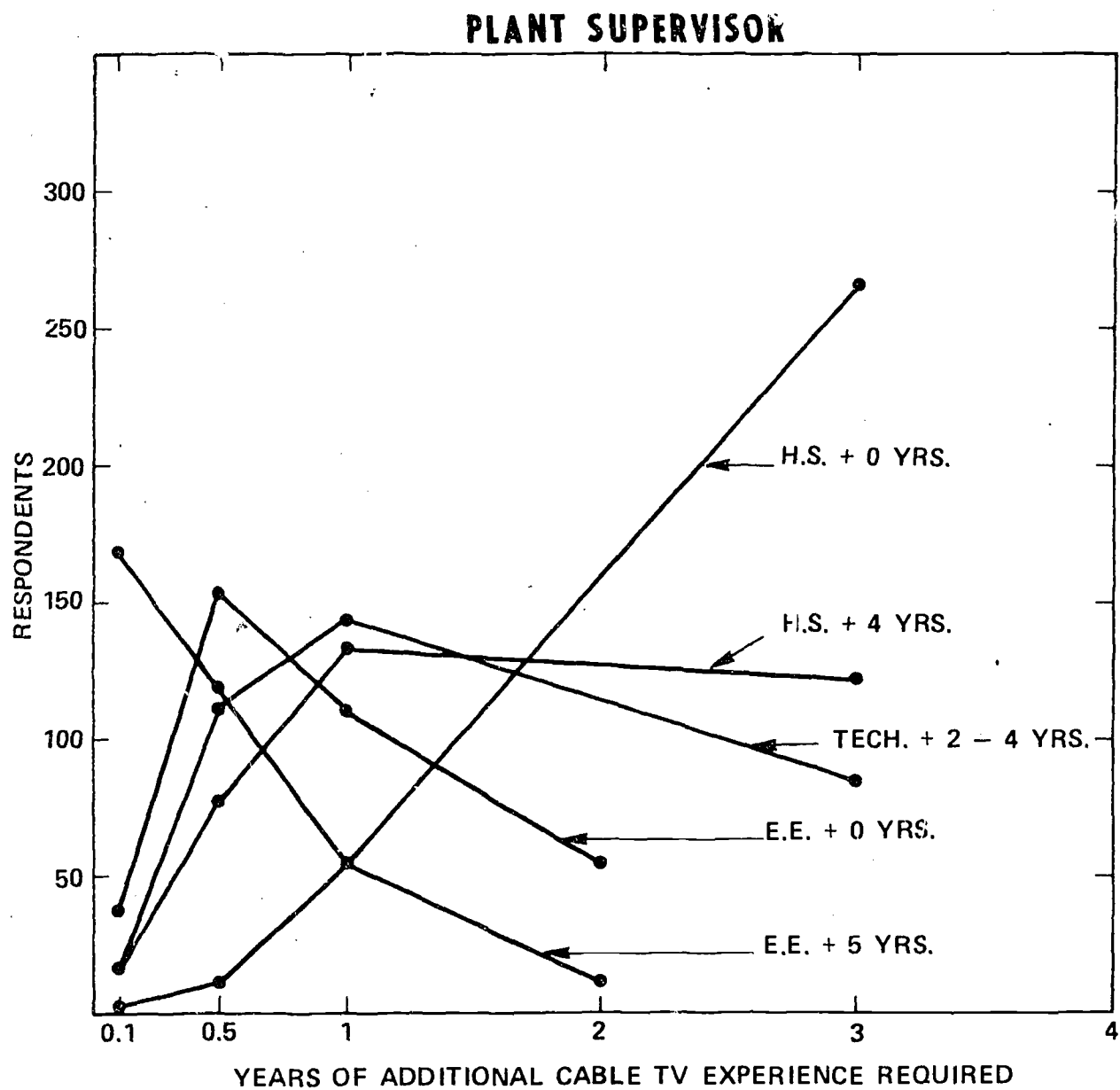
This is often a parallel job with the Chief Technician and is usually found in large systems. The Plant Supervisor is mainly responsible for the physical plant and for the construction and rebuilding of the cable system.

Experience Requirements:

Ten years minimum technical experience required. At least five years CATV experience in progressively responsible positions required. Should know cable construction methods, have mechanical ability and basic administrative and human relations experience.

Educational Requirements:

An E.E. Degree from a recognized school is most desirable and preferred. An in-depth knowledge of electrical and electronic theory is required.



SUMMARY OF RESPONSES
PLANT SUPERVISOR

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.	169	119	55	13 (2 years)
E.E.+NO EXPERIENCE	38	153	110	55 (2 years)
TECH.GRAD.+2-4 YRS.	16	108	144	78 (3 years)
H.S.+4 YRS.	15	77	135	121 (3 years)
H.S.+NO EXPERIENCE	1	11	54	267 (3 years)

CABLE SYSTEMS OWNER/OPERATOR

CHIEF TECHNICIAN

Duties & Responsibilities:

In some systems this position is called Chief Engineer. This position varies somewhat with system size. Most Chief Technicians are responsible for controlling all the activities of the engineering staff of the system. If the system is involved in construction he will control this activity as well. He will control all installation staff and have day to day responsibility for the technical integrity of the cable system. He should have expert knowledge of studio operations and the operation, care and maintenance of television cameras, audio equipment, film chains and microwave installations. He will be responsible for planning the plant facilities and for assisting in the preparation of cable system's capital expenditure and control.

He is responsible for all professional and technical concepts of CATV system design, the development of equipment planning and optimum layout for cable communications service, the specifications and standards for equipment, and material, the construction of facilities, equipment installation and all technical advice and counsel to the various staff and operating managers of the systems components.

In addition the Chief Technician will generally:

Furnish engineering and technical evaluation of proposed acquisitions. Develop and recommend engineering standards and procedures of operation, maintenance and repair. Audit existing systems for adherence to standards and procedures. Provide technical analysis of competitive systems. Promote the prestige of the company through technical and professional articles. Recommend engineering budget and maintain effective expense control to meet it.

Assist in the recruitment of key technical personnel and the promulgation of development programs to improve performance of technical personnel. Evaluate alternative strategies involving (a) new methods and concepts for existing systems,

and (b) recommendations for programs and new applications for exploitation.

Negotiate advantageous blanket purchasing arrangements with vendors. Participate in Market Development activities, giving technical advice and counsel on franchise acquisition, including signal availability studies, microwave surveys, application of FCC rules, antenna site selection and oral technical presentations to municipal representatives.

Maintain effective working relationships with operating and staff managers of the company and cooperate with them in matters of company and mutual interest.

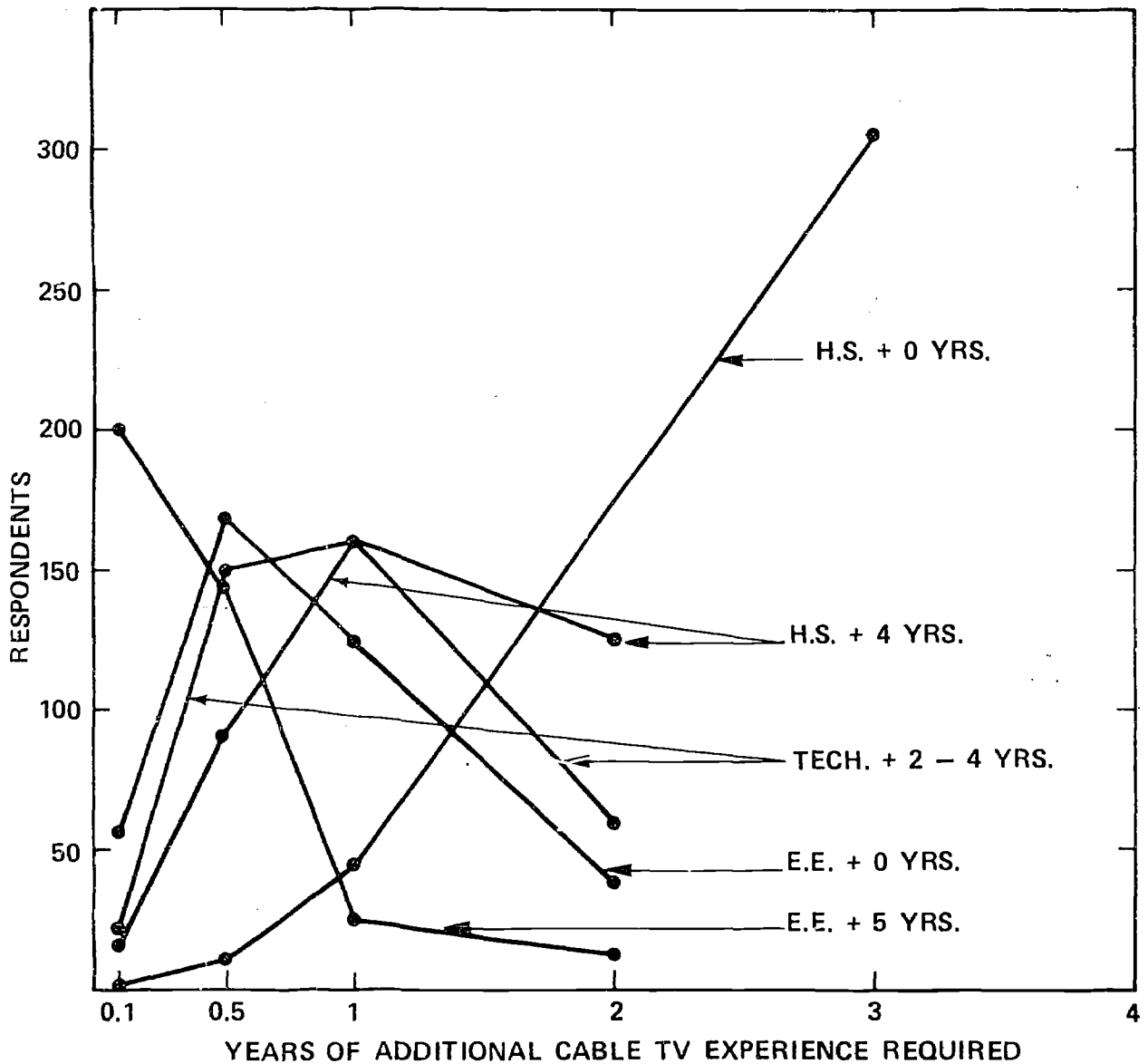
Experience Requirements:

Must have at least ten years technical experience. Must have had a minimum of seven years of CATV experience involving a progression of one responsible position to another. Will be expected to have a working knowledge of all technical aspects of the CATV industry with experience in several of the technical categories. Will also be fully conversant with FCC, state and municipal rules and regulations as they may apply to a CATV system.

Educational Requirements:

Should have an E.E. degree from a recognized school. An in-depth knowledge of electrical and electronic theory is required.

CHIEF TECHNICIAN



SUMMARY OF RESPONSES
CHIEF TECHNICIAN

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.	201	147	27	14 (2 years)
E.E.+NO EXPERIENCE	57	167	123	40 (2 years)
TECH.GRAD.+2-4 YRS.	22	149	159	58 (2 years)
H.S.+4 YRS.	19	90	158	125 (2 years)
H.S.+NO EXPERIENCE	2	10	45	306 (3 years)

CABLE SYSTEMS OWNER/OPERATOR

BENCH TECHNICIAN

Duties & Responsibilities:

Incumbent is a highly trained technician, capable of testing amplifiers, making distortion measurements, calibrating instruments, and using various specialized devices.

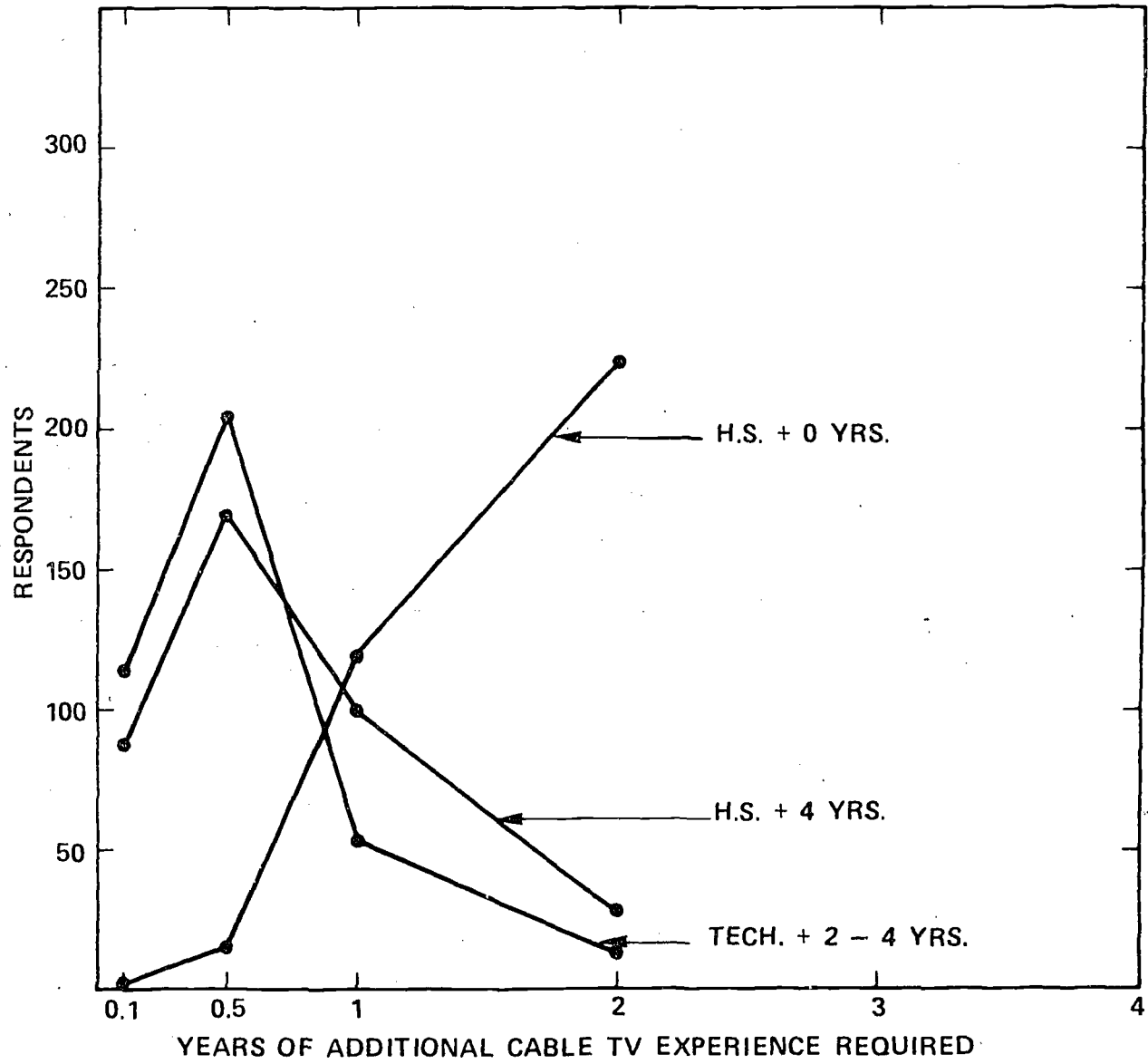
Experience Requirements:

Should have at least three years experience in CATV involving technical work with systems parts and components, as a Systems Maintenance Technician, for example.

Educational Requirements:

A high school diploma a prerequisite, with additional technical training preferred.

BENCH TECHNICIAN



SUMMARY OF RESPONSES
BENCH TECHNICIAN

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.				
E.E.+NO EXPERIENCE				
TECH.GRAD.+2-4 YRS.	115	204	53	13 (2 years)
H.S.+4 YRS.	87	169	99	28 (2 years)
H.S.+NO EXPERIENCE	2	16	119	223 (2 years)

CABLE SYSTEMS OWNER/OPERATOR

SYSTEMS MAINTENANCE TECHNICIAN

Duties & Responsibilities:

Will perform trouble-shooting, preventative maintenance and be capable of quickly analysing the location and cause of system outages.

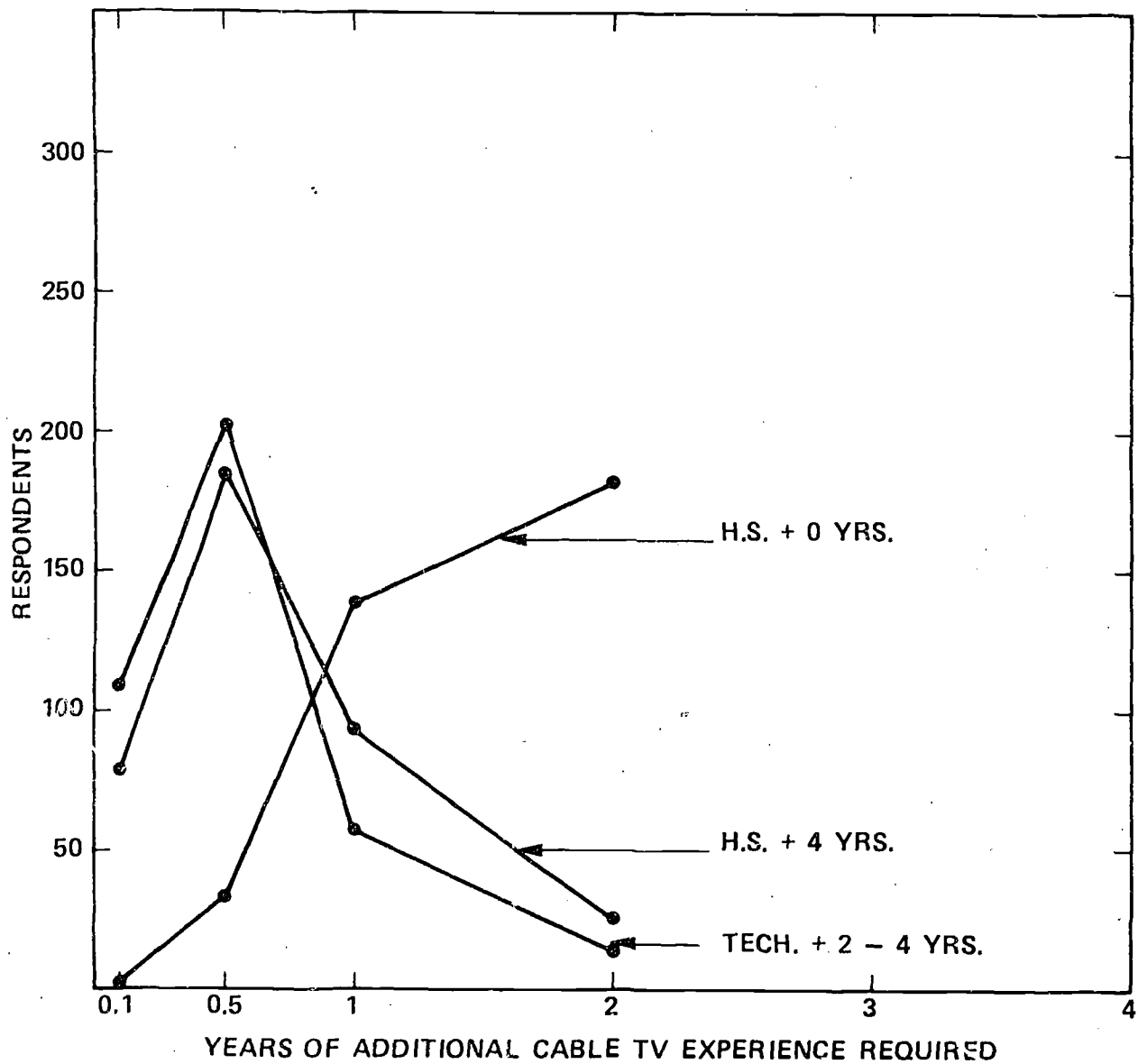
Experience Requirements:

At least six months to one year CATV training, e.g. in installation, building, wiring or construction.

Educational Requirements:

At least a high school diploma, with some technical training preferred.

SYSTEMS MAINTENANCE TECHNICIAN



SUMMARY OF RESPONSES
SYSTEMS MAINTENANCE TECHNICIAN

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.				
E.E.+NO EXPERIENCE				
TECH.GRAD.+2-4 YRS.	110	202	57	13 (2 years)
H.S.+4 YRS.	78	184	94	26 (2 years)
H.S.+NO EXPERIENCE	4	33	137	181 (2 years)

CABLE SYSTEMS OWNER/OPERATOR

CUSTOMER SERVICES TECHNICIAN

Duties & Responsibilities:

Incumbent is the company's day to day technical representative with the public. He will be able to determine whether a cable connection or a television set is at fault. Ability to see that a job is completed to the satisfaction of the individual customer is a prerequisite.

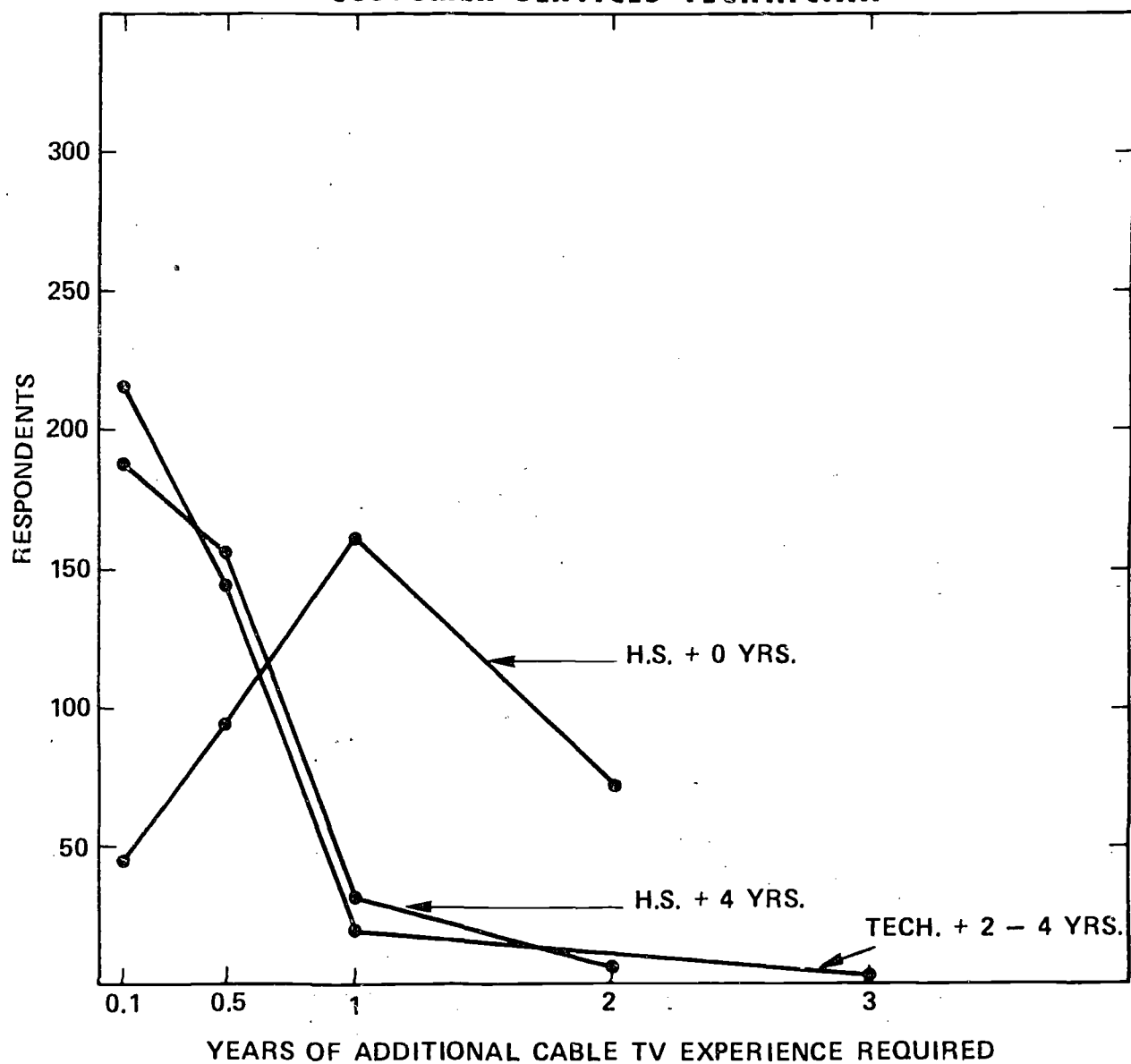
Experience Requirements:

At least six months CATV training, e.g. in installation, building, wiring or construction.

Educational Requirements:

High school diploma. Will have had some formal technical training.

CUSTOMER SERVICES TECHNICIAN



SUMMARY OF RESPONSES
CUSTOMER SERVICES TECHNICIAN

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.				
E.E.+NO EXPERIENCE				
TECH.GRAD.+2-4 YRS.	215	146	20	3 (3 years)
H.S.+4 YRS.	187	155	31	6 (2 years)
H.S.+NO EXPERIENCE	46	94	160	71 (2 years)

CABLE SYSTEMS OWNER/OPERATOR

INSTALLER TECHNICIAN

Duties & Responsibilities:

The Installer Technician is responsible for tapping the cable, making disconnects, relocations and change-overs, installing customer drops and grounding blocks, installing the inside wire, and performing set hook-ups. He is also responsible for maintenance of these facilities as well as the routine maintenance of all outside plant facilities including head-end equipment and distribution system electronics equipment. Is capable of determining whether it is a television set or the cable which is malfunctioning.

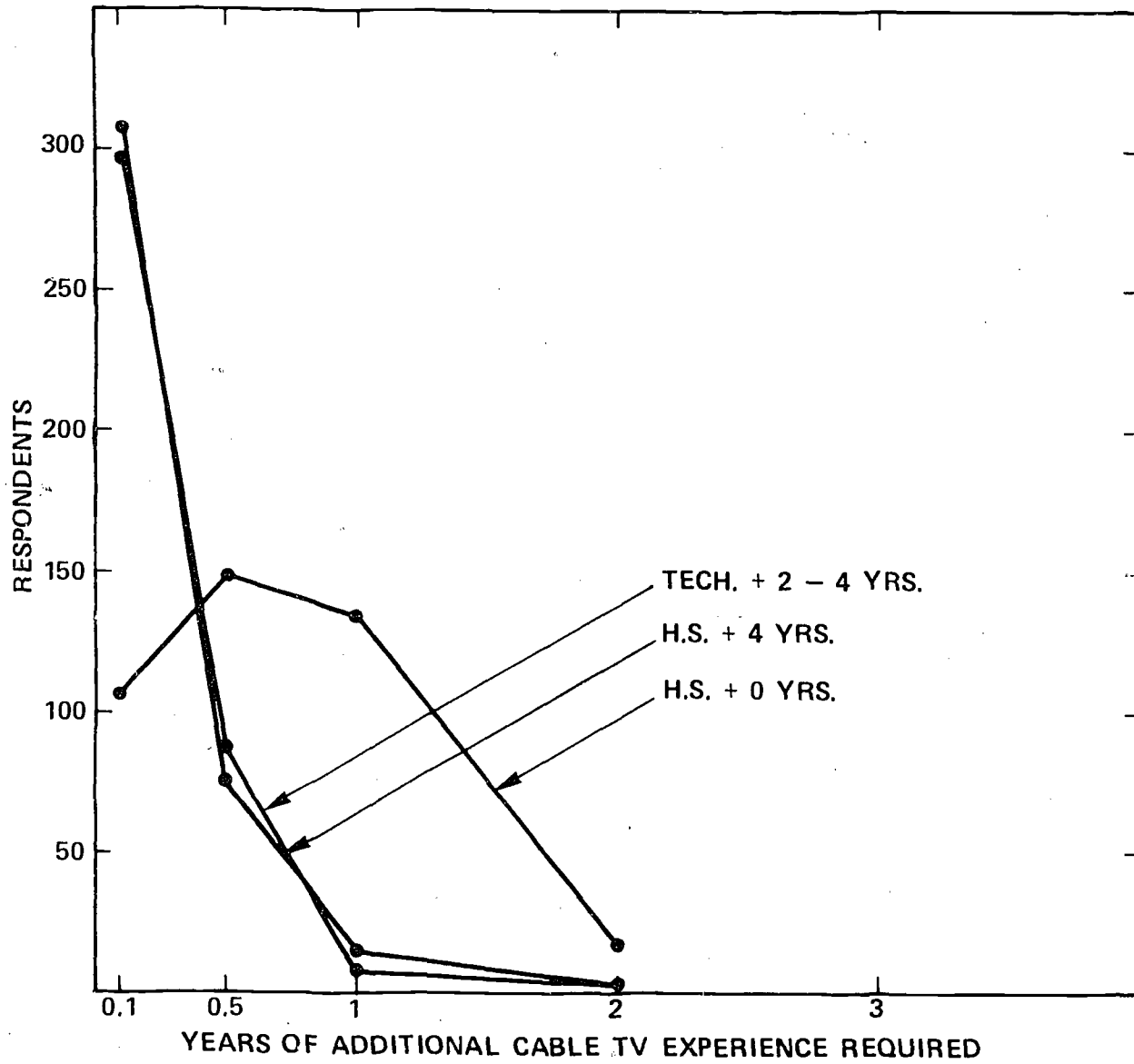
Experience Requirements:

Should have had some mechanical and/or technical experience. Previous CATV experience desirable, for example as an installer.

Educational Requirements:

At least a high school diploma.

INSTALLER TECHNICIAN



SUMMARY OF RESPONSES
INSTALLER TECHNICIAN

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.				
E.E.+NO EXPERIENCE				
TECH.GRAD.+2-4 YRS.	297	86	8	3 (2 years)
H.S.+4 YRS.	308	77	15	3 (2 years)
H.S.+NO EXPERIENCE	106	148	135	16 (2 years)

SYSTEMS CONSTRUCTION MANAGER

Duties and Responsibilities:

- To successfully and profitably construct turnkey systems;
- to provide for strand mapping of communities as contracted;
- to design and initiate such forms as are necessary for the factual reporting of jobs in progress and also of material handling for said jobs;
- to investigate and recommend corrective action for warranty claims against a supplier, in so far as systems constructed as turnkeys are concerned;
- to write procedures for construction and related field activities;
- to evaluate contractors and keep current a list of those most qualified to perform a high standard of workmanship;
- to negotiate the best possible prices for work performed by sub-contractors;
- to evaluate and provide for the training of field personnel;
- to visit each project while under construction as frequently as possible but not less than once a month;
- to meet with the customer, contractor, project supervisor, telephone company and power company representatives at the job site prior to beginning a construction project, to thoroughly acquaint all concerned with the people involved and the practices to be used;
- to maintain a liaison between the customer and the company while a project is under construction;
- to keep abreast on a daily basis of events occurring at each job that could affect the profitable completion of the job;
- to keep management informed of occurrences that may offset the project; and
- to assign field personnel as the needs of the project dictate.

Experience Requirements: No industry standards

Educational Requirements: No industry standards

SUMMARY OF RESPONSES
SYSTEMS CONSTRUCTION MANAGER EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.	4	4	0	0
E.E.+NO EXPERIENCE	0	3	5	0
TECH.GRAD.+2-4 YRS.	0	4	2	2 (2 years)
H.S.+4 YRS.	1	3	2	2 (2 years)
H.S.+NO EXPERIENCE	0	1	2	5 (3 years)

CONSTRUCTION

CONSTRUCTION

REGIONAL CONSTRUCTION SUPERVISOR

Duties & Responsibilities:

To oversee the requirements of several systems: generally, but not limited to, one geographic area;

to see to it that materials are kept flowing to site;

to visit projects frequently spending as much time as is necessary at each site;

to provide construction background in depth, assist in training and upgrading of project supervisors.

Experience Requirements: No industry standards

Educational Requirements: No industry standards

SUMMARY OF RESPONSES
REGIONAL CONSTRUCTION SUPERVISOR EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.	3	5	0	1 (4 years)
E.E.+NO EXPERIENCE	0	2	6	1 (4 years)
TECH. GRAD.+2-4 YRS.	0	2	3	4 (2 years)
H.S.+4 YRS.	1	1	3	4 (2 years)
H.S.+NO EXPERIENCE	0	1	1	7 (3 years)

CONSTRUCTION

CONSTRUCTION

PROJECT SUPERVISOR

Duties & Responsibilities:

To maintain on-site liaison between the customer and the company;
to keep the customer informed of progress;
to prepare reports;
to supervise Construction Supervisor and Systems Engineer; and
to have overall responsibility for the successful completion of the project.

Experience Requirements: No industry standards

Educational Requirements: No industry standards

SUMMARY OF RESPONSES
PROJECT SUPERVISOR EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.	7	0	1	0
E.E.+NO EXPERIENCE	0	6	2	0
TECH.GRAD.+2-4 YRS.	0	5	3	0
H.S.+4 YRS.	1	3	2	2 (2 years)
H.S.+NO EXPERIENCE	0	2	1	5 (2 years)

CONSTRUCTION

CONSTRUCTION

CONSTRUCTION SUPERVISOR

Duties & Responsibilities:

To directly supervise all phases of construction, seeing that contractor performs his work according to the best interest of the company;

to work with and assist Systems Engineer as required generally; alternate weekends off to keep at least one company supervisor on site at all times; and

to work closely with contractor's superintendent to correct any errors in construction as they occur.

Experience Requirements: No industry standards

Educational Requirements: No industry standards

SUMMARY OF RESPONSES

CONSTRUCTION SUPERVISOR EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.	7	0	0	1 (3 years)
E.E.+NO EXPERIENCE	0	6	1	1 (3 years)
TECH.GRAD.+2-4 YRS.	0	6	1	1 (3 years)
H.S.+4 YRS.	1	4	2	1 (3 years)
H.S.+NO EXPERIENCE	0	0	5	3 (2 years)

CONSTRUCTION

CONSTRUCTION

SYSTEMS ENGINEER (FIELD ENGINEER)

Duties & Responsibilities:

To see that all cables are swept and meet specs;
to see that electronics modules are properly installed;
to balance and set up the system and make it ready for
proof of performance;
to assist technical personnel at proof of performance;
to conduct signal surveys;
to assemble head-end equipment and check out same; and
to install and phase antennas; and supervise installation
of tower and antennas.

Experience Requirements: No industry standards

Educational Requirements: No industry standards

SUMMARY OF RESPONSES

SYSTEMS ENGINEER (FIELD ENGINEER) EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.	4	3	1	0
E.E.+NO EXPERIENCE	2	2	3	1 (2 years)
TECH.GRAD.+2-4 YRS.	2	1	4	1 (2 years)
H.S.+4 YRS.	1	2	2	3 (2 years)
H.S.+NO EXPERIENCE	0	0	1	7 (2 years)

CONSTRUCTION

CONSTRUCTION

SENIOR DESIGNER

Duties & Responsibilities:

Required to design CATV system using available equipment, map information, system specifications, field information with a high degree of competence;

Must have extensive knowledge of equipment characteristics, capabilities and limitations, design alternatives and other factors, including field situations and practices, past and current, which influence system design;

Will be required to provide field assistance on CATV system construction;

Will perform all functions of Designer, Jr. Designer, and Layout Draftsman;

Will conduct layout analysis to determine layout efficiency, equipment economy and system operation simplicity; and

Will provide training and supervision for Designer, Jr. Designer and Layout Draftsman.

Experience Requirements: No industry standards

Educational Requirements: No industry standards

SUMMARY OF RESPONSES

SENIOR DESIGNER EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.	3	3	2	0
E.E.+NO EXPERIENCE	1	1	4	2 (2 years)
TECH.GRAD.+2-4 YRS.	1	1	2	4 (2 years)
H.S.+4 YRS.	0	1	1	6 (2 years)
H.S.+NO EXPERIENCE	0	0	0	8 (3 years)

CONSTRUCTION

DESIGNER

Duties & Responsibilities:

Required to design CATV system using available equipment, map information, system specifications and field information with a minimum of supervision;

Must have a good knowledge of equipment characteristics, capabilities and limitations, design alternatives and other factors, including field situations, and practices which influence system design;

May be required to provide field assistance on CATV system construction;

Will perform all functions of Jr. Designer and Layout Draftsman; and

Will provide training and supervision for Jr. Designer and Layout Draftsman.

Experience Requirements: **No industry standards**

Educational Requirements: **No industry standards**

SUMMARY OF RESPONSES
DESIGNER EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.	6	2	0	0
E.E.+NO EXPERIENCE	1	5	2	0
TECH.GRAD.+2-4 YRS.	1	3	2	3 (2 years)
H.S.+4 YRS.	0	1	5	2 (2 years)
H.S.+NO EXPERIENCE	0	0	0	8 (3 years)

CONSTRUCTION

CONSTRUCTION

JUNIOR DESIGNER

Duties & Responsibilities:

To design CATV system using available equipment, map information and system specifications. Design to be directed by Designer or Senior Designer.

Performs equipment count and cable measurements of completed designs.

May act as assistant to Designers.

Must be able to perform the functions of the Layout Draftsman.

Experience Requirements: No industry standards

Educational Requirements: No industry standards

SUMMARY OF RESPONSES
JUNIOR DESIGNER EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.	7	1	0	0
E.E.+NO EXPERIENCE	3	5	0	0
TECH.GRAD.+2-4 YRS.	2	4	3	0
H.S.+4 YRS.	1	4	2	2 (3 years)
H.S.+NO EXPERIENCE	0	0	4	4 (3 years)

CONSTRUCTION

CONSTRUCTION

ENGINEERING FIELDMAN (STRAND MAPPER)

Duties & Responsibilities:

The Engineering Fieldman will prepare outside plant engineering detail and layout, including field sketches; assist in coordinating work and other agreements with other utilities, governmental agencies, building or other construction organizations and any interested parties, as required; surveys, wheel measures, and denotes on field drawings, pole line engineering details for pole line construction and underground layout to meet with National Electric Safety Code and other governing regulations or specifications; and perform such other duties as the company may deem necessary. Assist in preparation of appraisals, budgets, estimates and requests for custom work, order billing and special projects; provide project and work order field data, wheeling and staking, as required; make pole and other aerial, buried and underground plant facility drawings and verify faults or conditions which might render the facilities unsafe, unserviceable or otherwise non-standard; make diagrams, drawings, field and other sketches, as required, for budget, construction detail, engineering schematics, estimate take-off and extension, job orders and estimate control.


Experience Requirements:

Minimum of two years experience in one or more of the following is desirable:

- Outside plant construction (Cable and Line Work)
- Other applicable CATV experience

Must also have ability to properly use tools and measuring instruments and other equipment normally used in applicable phases of the CATV industry; ability to correctly interpret blueprints, specifications and other written or graphic material, and apply to the job; ability to accurately make sketches and diagrams, as required; ability to communicate, in writing, information and instructions, as required. Must be able to work safely on ladders, poles, elevated platforms and other equipment.

Educational Requirements:

 High school diploma, equivalency certificate or ability to attain.

SUMMARY OF RESPONSES
ENGINEERING FIELDMAN (STRAND MAPPER) EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.	5	1	1	0
E.E.+NO EXPERIENCE	3	3	1	0
TECH.GRAD.+2-4 YRS.	4	3	1	0
H.S.+4 YRS.	0	5	3	0
H.S.+NO EXPERIENCE	0	3	2	3 (3 years)

CONSTRUCTION

LAYOUT DRAFTSMAN

Duties & Responsibilities:

The Draftsman prepares charts, diagrams, drawings, and other graphic materials for use by Engineering and other departments, as required; performs such other duties as the company may deem necessary.

He will prepare original and final diagrams, drawings, graphs, maps, overlays, tracings and other graphic materials, in appropriate scales and dimensions according to standard company formats, from notes, sketches, illustrations and other detail information;

Assist in field surveys, preparation of cost estimates, inventories, material and equipment ordering information;

Operate with proficiency, office machines, including calculators, reproduction and other equipment normally used in applicable phases of the CATV industry;

Perform minor maintenance on reproduction and other equipment which is used in the area, as required;

Initiate reports and maintain plant and engineering records, as required; and

Assist in joint pole use records maintenance.

Experience Requirements:

Minimum of one year experience in general or engineering drafting is desirable. Must also have ability to proficiently use tools, instruments and materials normally used in applicable phases of the CATV industry. Ability to correctly interpret blueprints, specifications and other written or graphic material and apply to the job. Accuracy and neatness in drawing and lettering, and the ability to write legibly, must also be able to work alone or in a group, with or without supervision, and have personality, appearance and verbal ability to maintain good relations with fellow employees.

Educational Requirements:

High School diploma, equivalency certificate or ability to attain.

SUMMARY OF RESPONSES
LAYOUT DRAFTSMAN EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.	7	0	0	0
E.E.+NO EXPERIENCE	5	2	0	0
TECH.GRAD.+2-4 YRS.	5	3	0	0
H.S.+4 YRS.	5	1	2	0
H.S.+NO EXPERIENCE	0	4	2	2 (2 years)

CONSTRUCTION

CONSTRUCTION

CHIEF ENGINEER

Duties & Responsibilities:

The Chief Engineer is responsible for directly controlling the overall activities of all engineering and construction forces and for functionally controlling all installation, maintenance and supply forces.

Depending upon the size of the system, the Chief Engineer position can be truly administrative or it can be a working-technician position. In either instance the Chief Engineer's prime responsibility is for the technical performance of the service and for all other technical personnel.

Must have ability to organize, plan, motivate and control system technical performance, and growth. May or may not be required to have business-operational abilities but must be management-oriented and perform professionally at this level. Must be an individual who keeps abreast of technical developments in his field while being aware of operational responsibilities in system business-performance. In some systems he may differ only slightly from an Assistant Manager or Manager-Technician if these positions do not exist above his classification in that system.

His principal responsibilities are to:

Provide optimum customer service.

Develop and implement preventative maintenance schedules so as to minimize down-time and trouble reports.

Ensure that all trouble reports are handled promptly.

Ensure that all cable installations are made properly and that signal strength is read and recorded.

Train employees for their respective jobs so as to utilize their full capabilities.

CONSTRUCTION

Inspect and maintain all head-end equipment and assure that all components are working properly.

Provide for adherence to Corporation standards for the maintenance of the system.

Provide for employee safety.

Maintain effective control over stock of installation and maintenance materials. Recommend purchases of materials required to operate system.

Maintain close contact with repairmen on duty after normal working hours and assure that any maintenance problems that arise during these periods are resolved promptly.

Sweep and align all line amplifiers periodically so as to assure maximum equipment performance.

Repair equipment promptly and assure that all spare equipment is working properly and is available for immediate use.

Maintain vehicle records so as to achieve maximum performance from each vehicle and minimize breakdown.

Control costs within operations, including personnel costs, maintenance expense, power costs and automotive expense.

Work with the System Manager in preparation of system maintenance and operating budgets.

Maintain records required by FCC and other agencies relative to use of two-way radios and ensure correct usage.

Ensure proper utilization of all Company-owned test equipment, tools and vehicles.

Experience Requirements: No industry standards

Educational Requirements: No industry standards

SUMMARY OF RESPONSES
CHIEF ENGINEER EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.				
E.E.+NO EXPERIENCE				
TECH.GRAD.+2-4 YRS.	2	4	1	1 (2 years)
H.S.+4 YRS.	0	2	4	2 (2 years)
H.S.+NO EXPERIENCE	0	0	1	6 (3 years)

CONSTRUCTION

CONSTRUCTION

SENIOR INSTALLER

NOTE: In addition to skills and experience several systems designate job title and level of responsibility of Installer in ratio to number of residential and/or commercial first outlet installations per day; ranging from 6 residential installations to 12 residential or 35 commercial first outlets per 8 hour day.

Duties & Responsibilities:

Works without supervision on apartment house and/or large motel installations, installs apartment house amplification equipment, understands and observes electrical safety rules for powering apartment house amplifiers, provides training instruction and guidance for Apprentice and Junior Installers assigned to work with him. Performs line construction, stranding, lashing, does tower work under supervision.

Must have demonstrated ability to diagnose problems on large commercial installations, repair and maintain apartment house amplifiers, to produce at least 10 first outlet residential installations or 25 commercial outlets per 8 hour day, to teach junior installers good technique. Perform system splicing, do tower work. (Note: In some systems a Chief Installer will produce at least 12 first outlet residential installations or 35 commercial outlets per 8 hour day.)

Climbs and works from poles. Uses various tools, including electric drill, climbing gear, etc. Drives company vehicle. Responsible for performing work in a safe manner. Represents the Company to the public and should be neat in appearance.

CONSTRUCTION

Installs, changes or removes CATV service connection, associated apparatus, channel converter equipment. Strings and replaces drop wire, ground wire etc. Consults with and advises customers regarding best location for equipment, inside wiring and cabling, depending upon type of building construction, etc. Does advance wiring, tests for proper operation of signals and instructs subscribers in proper use. Requires ability to read and work from simple prints and drawings.

Operates test equipment to locate trouble. Performs related maintenance work, cuts brush, replaces cable arms, etc.

Recommends additional facilities needed and originates job orders and estimates. Should be familiar with system and cable records, electronics, maps, outside plant construction, plant practices and specifications, etc.

Performs other similar work which he may be called upon to perform and all other work necessary or desirable to complete the job to which he has been assigned.

Experience Requirements: No industry standards

Educational Requirements: No industry standards

SUMMARY OF RESPONSES
SENIOR INSTALLER EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.				
E.E.+NO EXPERIENCE				
TECH.GRAD.+2-4 YRS.	6	2	0	0
H.S.+4 YRS.	4	4	0	0
H.S.+NO EXPERIENCE	1	1	5	0

CONSTRUCTION

4

CONSTRUCTION

JUNIOR INSTALLER

Duties & Responsibilities:

May work without supervision or with minimal supervision on residential or commercial installations; will be capable of installing taps in lines; to install drops in homes; make connections and/or disconnects; will have capability to diagnose and repair problems in commercial installations; can handle trenching machinery and cable layers; will be capable of installing 6 to 8 first outlet installations per day.

Skilled at use of all hand tools, ladders, associated equipment.

Can accurately read appropriate measuring devices and adjust tap levels.

Understands theory of tap-value selections and installations.

Can analyze picture quality and judge acceptability.

Can assist in line construction and system trouble shooting to limited degree, as needed, and under supervision as instructed.

Needs some close supervision.

Knows pole and road clearance standards and designs drops accordingly.

Experience Requirements: No industry standards

Educational Requirements: No industry standards

SUMMARY OF RESPONSES

JUNIOR INSTALLER EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.				
E.E.+NO EXPERIENCE				
TECH.GRAD.+2-4 YRS.	8	0	0	0
H.S.+4 YRS.	8	0	0	0
H.S.+NO EXPERIENCE	2	6	0	0

CONSTRUCTION

CONSTRUCTION

APPRENTICE INSTALLER

Duties & Responsibilities:

Works under close supervision in trainee status.

Within six months must know how to climb poles safely, must know rules for safe work aloft, must know how to make-up a connector, understand use of routine hand tools and field strength meter, and be able to operate as TV camera-man. Has fundamental knowledge of how a CATV system works.

Experience Requirements: No industry standards

Educational Requirements: No industry standards

SUMMARY OF RESPONSES

APPRENTICE INSTALLER EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.				
E.E.+NO EXPERIENCE				
TECH.GRAD.+2-4 YRS.	8	0	0	0
H.S.+4 YRS.	8	0	0	0
H.S.+NO EXPERIENCE	6	2	0	0

CONSTRUCTION

CONSTRUCTION

SENIOR TECHNICIAN

Duties & Responsibilities

He will:

Be able to install and adjust preamps, antennas, be able to set up head-end, adjust and balance head-end, adjust and set up TV cameras and video tape recorders, demonstrate deep knowledge of system design, layout and operation to be able to diagnose outages and restore service promptly in the event of system failure.

Be able to perform full maintenance on all equipment used in head-end and in system, be able to align all equipment on oscilloscope, make all repairs to all electronic equipment including camera and VTR.

He will:

Be able to perform complete proof of performance on system including summation sweep and cross-modulation test, understand underlying elements of system parameters checked in proof of performance, be able to design system expansions, adjust antennas to eliminate co-channel interference, be prepared to fill in for Chief Technician in event of his absence from job for vacation, sickness, etc.

This employee may supervise work of other technicians; he will probably assign work, control quality and production and generally assist the Chief Technician in overall system technical control.

He will possess:

all capabilities of **Junior Technicians and lower** classifications.

ability to organize work, motivate and control assignments and personnel.

CONSTRUCTION

The Senior Technician also:

may direct linemen and/or installers where their work falls within technical applications of systems performance and/or where they are actually working temporarily in technical maintenance.

may or may not be required to have abilities for higher classifications if performance at this level is professional and satisfactory.

Experience Requirements: No industry standards

Educational Requirements: No industry standards

SUMMARY OF RESPONSES
SENIOR TECHNICIAN EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.				
E.E.+NO EXPERIENCE				
TECH.GRAD.+2-4 YRS.	6	2	1	0
H.S.+4 YRS.	1	7	1	0
H.S.+NO EXPERIENCE	0	0	5	3 (3 years)

CONSTRUCTION

JUNIOR TECHNICIAN

Duties & Responsibilities:

He will:

Be able to work alone to install splices and equipment in feeder lines, balance bridgers, balance line extenders, diagnose and repair distribution line and be able to handle standby duty.

Will be able to work without supervision on trunk, sub-trunk and distribution lines, install trunk line and distribution equipment, balance entire system, diagnose and repair truck and distribution problems, install power supplies, perform simple equipment repairs on bench. Understands CATV basic theory, understands camera theory, operates switches, mixers, video tape recorders. Will be able to sweep cables.

Can trouble-shoot all drop and distribution system problems.

Can maintain trunk and distribution levels (but not necessarily be capable of complete system balance).

Can replace malfunctioning equipment and recognize same.

Can make repairs to cable.

Should have all qualifications of Senior Installers and Linemen.

Can respond to customer complaints and satisfy same through technical response and customer relations ability.

Can keep accurate system records and reporting forms.

Has proven basic electronic knowledge and is capable of minimal internal equipment repair with supervision and instruction.

Comprehends theory of basic test-bench setup and alignment procedures on plant equipment.

Experience Requirements: No industry standards

Educational Requirements: No industry standards

SUMMARY OF RESPONSES
JUNIOR TECHNICIAN EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.				
E.E.+NO EXPERIENCE				
TECH.GRAD.+2-4 YRS.	7	2	0	0
H.S.+4 YRS.	5	4	0	0
H.S.+NO EXPERIENCE	0	2	4	2 (3 years)

CONSTRUCTION

CONSTRUCTION

APPRENTICE TECHNICIAN

Duties & Responsibilities:

Works with supervision as a trainee on head-end, tower, antenna, preamps and distribution system.

Can trouble-shoot all drop and distribution system problems.

Can maintain trunk and distribution levels (but not necessarily be capable of complete system balance).

Can replace malfunctioning equipment and recognize same.

Can make repairs to cable.

Should have all qualifications of Senior Installers and Linemen.

Can respond to customer complaints and satisfy same through technical response and customer relations ability.

Can keep accurate system records and reporting forms.

Will have proven basic electronic knowledge and be capable of minimal internal equipment repair with supervision and instruction.

Comprehends theory of basic test-bench setup and alignment procedures on plant equipment.

Experience Requirements: No industry standards

Educational Requirements: No industry standards

SUMMARY OF RESPONSES
APPRENTICE TECHNICIAN EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.				
E.E.+NO EXPERIENCE				
TECH.GRAD.+2-4 YRS.	8	0	0	0
H.S.+4 YRS.	7	1	0	0
H.S.+NO EXPERIENCE	3	2	3	0

CONSTRUCTION

CONSTRUCTION

LINEMAN

Duties & Responsibilities

Basically works in system construction. Will often work with minimum of supervision on installations and systems technical adjustments as needed and capable.

Climbs and works from poles. Uses various tools necessary in the installation, maintenance and removal of outside plant, etc. Responsible for performing work in a safe manner.

Digs pole and anchor holes by hand or with aid of power auger. Sets poles aided by truck boom, pikes poles, sets anchors, and fills and tamps holes. Places guys. Drills holes; mounts cable arms, crossarms, and clamps. Strings cable, etc., cable messenger, and sags in. Strings aerial cable wrapping to messenger by use of spinner.

Removes abandoned messenger and cable, pulling in wire with aid of power take-up reel. Dismantles crossarms, etc. and removes poles. Salvages all reusable material. Replaces old or damaged poles, wire, cable, etc.

May push pipe under roads, railroads, etc., by use of jack and pulls cable through pipe with fish wire. May work in man-holes, pulling in underground cable.

Assists in loading truck and pole or cable trailer with materials and equipment. Cuts brush and trims trees using tree trimmers, saws and axes, or operates sprayer equipment. May drive company vehicles. May tend reel when stringing lines. May maintain various hand tools such as shovels, axes, etc. May post warning signs and flag traffic. Performs work requiring considerable physical effort, and should be at least average in size and strength.

Performs other similar work which he may be called upon to perform and all other work necessary or desirable to complete the job to which he has been assigned.

Experience Requirements: No industry standards

Educational Requirements: No industry standards

SUMMARY OF RESPONSES
LINEMAN EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.				
E.E.+NO EXPERIENCE				
TECH.GRAD.+2-4 YRS.	6	1	1	0
H.S.+4 YRS.	4	3	1	0
H.S.+NO EXPERIENCE	1	4	2	1(3 years)

CONSTRUCTION

CONSTRUCTION

CABLE SPLICER

Duties & Responsibilities:

The Cable Splicer establishes and maintains outside cable plant facilities; performs such other duties as the company may deem necessary. Performs completion, routine and other tests, inspections and observation, as required, of aerial, buried, submarine and underground cable plant, special purpose and trunk cable connection at origination facility or other similar terminating and intermediate locations to the last point of cable distribution connection to another cable, including cable amplifiers, power supplies or passive units and other access points, including cable terminations at points of entrance on subscriber premises, where applicable. Locates and clears all trouble disclosed as a result of such tests, inspections, observations or trouble reports from any source.

Places, rearranges, removes, repairs or replaces and connects, as required, amplifiers, power supplies, passive devices, cable; ensures that splices and terminators are all made secure against leakage of moisture or radio frequency interference according to specifications or other requirements.

Makes transfers, changes and additions in outside cable plant facilities, including rearranging, rerouting and transferring, as required, aerial and buried active passive equipment.

Arranges cable at multiple access points such as vaults or pedestals so as to permit ready access to any splice and its enclosure, after completion, without affecting any other cable, either electrically or mechanically.

Makes spliced cable connections in such manner as to ensure electrical continuity, and installation equivalent to that of an unspliced section of similar cable; matches color-coded cables, tests all cable conductors to verify integrity of continuity, polarity and absence of transpositions or other faults.

CONSTRUCTION

Makes all mechanical or other permanent splice enclosures, complete with bonding, as required, in such manner as to be an electrical and mechanical equivalent of an unspliced section of similar cable.

Operates trucks, hoists, winches, and other motorized or hydraulic equipment; as required.

Assists in laying buried cable pulling aerial or underground cable, placing cable messenger, lashing cable and placing hardware as required.

Initiates reports and maintains plant records, as required.

Experience Requirements:

Minimum of one year experience in one or more of the following is desirable:

1. Telephone installation and repair.
2. Outside plant construction.
3. Other applicable CATV experience; must also have ability to properly use tools, testing, measuring and other instruments and equipment normally used in applicable phase of the CATV industry; work safely on ladders, poles, elevated platforms and other equipment; lift reasonably heavy objects; work in damp, cold, dry, hot or confined areas; work alone or in a group, with or without supervision. Must be able to correctly interpret blueprints, specifications and other written or graphic material and apply to the job.

Educational Requirements:

No industry standards

SUMMARY OF RESPONSES

CABLE SPLICER EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.				
E.E.+NO EXPERIENCE				
TECH.GRAD.+2-4 YRS.	4	3	1	0
H.S.+4 YRS.	2	5	1	0
H.S.+NO EXPERIENCE	0	4	3	1

CONSTRUCTION

MANUFACTURING

MANAGER (FUNCTIONAL) ENGINEERING

Duties & Responsibilities:

Manages a major subdivision of a company's research or engineering activities.

Participates in the development of policies, objectives, programs and procedures, and interprets and carries out same through his organization.

Participates in the development of budgets and schedules for the approval of management and is responsible for operating accordingly.

Coordinates the function and activities of his organization with other departments, to assure attainment of overall engineering and management objectives.

Responsible for carrying out management personnel policies in his organization, including training, employee merit review, salary increases, promotions, etc.

May be responsible for the engineering of a complete product and its performance.

Experience Requirements:

Knowledge of either engineering, mathematics, physics, chemistry or related sciences sufficient to plan, formulate and manage the activities of his organization. Thorough working knowledge of production problems and/or methods of setting up projects. Familiar with the technical phases of business law, contracts and patents, as they affect a company's operations. Demonstrated organizing ability, good judgement, initiative and decisiveness. Ten years experience in specialized engineering or science, including five years directing activities of other people.

Educational Requirements:

B.S. or equivalent in engineering, physics, chemistry, mathematics, or related sciences; studies in business management desirable.

SUMMARY OF RESPONSES
MANAGER (FUNCTIONAL) ENGINEERING EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.	2	4	1	1 (2 years)
E.E.+NO EXPERIENCE	0	2	2	5 (4 years)
TECH.GRAD.+2-4 YRS.	0	2	0	4 (4 years)
H.S.+4 YRS.	0	0	1	3 (2 years)
H.S.+NO EXPERIENCE	0	0	1	1 (3 years)

MANUFACTURING

MANUFACTURING

DEPT. MANAGER (FUNCTIONAL) ENGINEERING

Duties & Responsibilities:

Manages a department of research or engineering personnel engaged in investigating, designing, developing, or testing of engineering or scientific projects.

Responsible for carrying out company personnel policies in his department, including training, merit review, increases, promotions, etc. Responsible for coordinating all group activities within the department.

Administers programs and procedures for his organization in accordance with approved policies.

Coordinates the individual or joint efforts of specialists for such information and assistance as may be required to effectively achieve the project objectives of his department.

Experience Requirements:

Eight years experience required in specialized engineering or science, including 5 years directing activities of other people. Knowledge of either engineering, mathematics, physics chemistry or related sciences sufficient to plan, formulate and manage the activities of his organization. Thorough working knowledge of production problems and/or methods of setting up projects. Familiar with the technical phases of business law, contracts and patents as they effect a company's operations.

Educational Requirements:

B.S. or equivalent in engineering, physics, chemistry or mathematics or related sciences; studies in business management desirable.

SUMMARY OF RESPONSES

DEPARTMENT MANAGER (FUNCTIONAL) ENGINEERING EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.	3	2	3	2 (2 years)
E.E.+NO EXPERIENCE	0	2	1	5 (4 years)
TECH.GRAD.+2-4 YRS.	0	1	1	2 (2 years)
H.S.+4 YRS.	0	0	1	3 (3 years)
H.S.+NO EXPERIENCE	0	0	1	1 (2 years)

MANUFACTURING

MANUFACTURING

SR. ENGINEERING SPECIALIST (SR. RESEARCH SPECIALIST)

Duties & Responsibilities:

Senior specialists will perform much of the work of an engineering specialist; the difference is found in the value of the work to the company and the complexity of the work involved.

Responsible for applied research or advanced engineering in the development of new products, material, structures, instruments, processes, etc., to be used in or with existing or new models and components.

Responsible for the analysis and experimentation, under controlled conditions, in the study of unknown factors.

Responsible for determining specifications covering materials, dimensions, temperatures and pressures to be experienced, forces to be withstood and other conditions to be met for the guidance of the designer of a model or component.

Performs special research or engineering evaluations and feasibility studies of materials or processes.

Serves as a technical consultant to designers or others in specialized field of engineering or science.

Reviews reports of other groups of engineers or scientists in related fields.

Experience Requirements:

Seven years experience required. Exceptional knowledge in a specific scientific or engineering field, sufficient to be recognized in engineering and industry circles as an outstanding expert in his particular area of specialization.

Exceptional ability to work independently without technical guidance, analyze, determine and recommend designs, processes, materials, structures, instruments, etc. to be used in or with existing techniques, new models or components.

Educational Requirements:

B.S. degree or equivalent, M.S., Ph.D., preferred in specialized field of science or engineering.

SUMMARY OF RESPONSES

SENIOR ENGINEERING SPECIALIST EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.	5	3	1	0
E.E.+NO EXPERIENCE	1	1	1	5 (4 years)
TECH. GRAD.+2-4 YRS.	0	2	0	4 (5 years)
H.S.+4 YRS.	0	1	1	2 (3 years)
H.S.+NO EXPERIENCE	0	0	1	1 (4 years)

MANUFACTURING

MANUFACTURING

ENGINEERING SPECIALIST (RESEARCH SPECIALIST)

Duties & Responsibilities:

Responsible for applied research or advanced engineering in the development of new products, materials, structures, instruments, processes, etc. to be used in or with existing or new models and components.

Responsible for the analysis and experimentation, under controlled conditions, in the study of unknown factors.

Responsible for determining specifications covering materials, dimensions, temperatures and pressures to be experienced, forces to be withstood, and other conditions to be met with for the guidance of the designer of a model or component.

Performs special research or engineering evaluations and feasibility studies of materials, components or processes.

Serves as a technical consultant to designers or others in specialized field of engineering or science.

Reviews reports of other groups of engineers or scientists in related field.

Experience Requirements:

Six years experience required. Thorough knowledge in a specific scientific or engineering field, sufficient to be recognized in engineering and industry circles as an outstanding expert in his particular area of specialization. Ability to work independently without technical guidance, analyze, determine and recommend designs, processes, materials, structures, instruments, etc., to be used in or with existing techniques, new models or components.

Educational Requirements:

B.S. degree or equivalent, M.S., Ph.D. preferred in specialized field of science or engineering.

SUMMARY OF RESPONSES
ENGINEERING (RESEARCH) SPECIALIST EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.	5	3	1	0
E.E.+NO EXPERIENCE	1	2	1	4 (4 years)
TECH.GRAD.+2-4 YRS.	0	3	0	3 (5 years)
H.S.+4 YRS.	0	1	2	1 (2 years)
H.S.+NO EXPERIENCE	0	0	1	1 (2 years)

MANUFACTURING

MANUFACTURING

PROJECT ENGINEER (PROJECT SCIENTIST, PHYSICIST, ETC.)

Duties & Responsibilities:

Responsible for the technical administration of one or more defined engineering research or production projects, including the direction of assigned personnel.

Conducts specialized studies of advanced scientific nature.

Responsible for the design of components and assemblies to meet project requirements, including the revision or redesign of present components.

Responsible for performance of laboratory or field tests.

Responsible for the release of all drawings, specifications and samples related to project.

Responsible for detailed reports as required, including recommendations.

Experience Requirements:

Thorough working knowledge of engineering, mathematics, physics, chemistry or related sciences, sufficient to assume responsibility for a defined problem or project in a specialized field of science, engineering or production. Technical ability to carry out assigned projects with a moderate amount of supervision, or leadership qualifications sufficient to direct the work of assigned personnel.

Educational Requirements:

B.S. or equivalent in Engineering, Physics, Chemistry, Mathematics, or related sciences.

SUMMARY OF RESPONSES

PROJECT ENGINEER (SCIENTIST, PHYSICIST) EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.	5	2	2	0
E.E.+NO EXPERIENCE	0	4	1	3 (3 years)
TECH.GRAD.+2-4 YRS.	0	2	1	4 (4 years)
H.S.+4 YRS.	0	0	2	2 (3 years)
H.S.+NO EXPERIENCE	0	0	1	1 (2 years)

MANUFACTURING

MANUFACTURING

SENIOR ENGINEER (SENIOR SCIENTIST, ETC.)

Duties & Responsibilities:

Participates in the research, design, and development or production engineering of a phase of a defined project or projects.

Determines design requirements and prepares engineering data for drawings and specifications of details, parts, assemblies or installations.

Performs tests in the laboratory or field. Makes or initiates engineering changes.

Makes, or directs the making of sample parts or assemblies.

Performs other specialized research or engineering work as required.

Responsible for the checking and approval of drawings.

Prepares and submits progress reports as required.

Senior Engineers in this classification will perform much of the work of an engineer; the difference is found in the degree of responsibility assigned and supervision required.

Experience Requirements:

Three years experience required.

Good working knowledge of either engineering physics, chemistry, mathematics, or related sciences sufficient to recognize a problem and solve it.

Perform specialized research or production engineering and be able to compile reports and/or other data as required.

Ability to carry out assigned duties with a moderate amount of supervision or instructions.

Ability to direct the efforts of others in the completion of assigned duties.

Educational Requirements:

B.S. or equivalent in engineering physics, mathematics or related sciences.

SUMMARY OF RESPONSES

SENIOR ENGINEER (SCIENTIST, ETC.) EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.	6	3	0	0
E.E.+NO EXPERIENCE	0	3	2	2 (3 years)
TECH.GRAD.+2-4 YRS.	0	2	0	4 (3 years)
H.S.+4 YRS.	0	0	2	2 (3 years)
H.S.+NO EXPERIENCE	0	0	1	1 (4 years)

MANUFACTURING

MANUFACTURING

ENGINEER (SCIENTIST, ETC.)

Duties & Responsibilities:

Participates in the research, design, and development or production engineering of a phase of a defined project or projects.

Determines design requirements and prepares engineering data for drawings and specifications of details, parts, assemblies, or installations.

Performs tests in the laboratory or field. Makes or initiates engineering changes.

Makes, or directs the making of, sample parts or assemblies.

Performs other specialized research or engineering work as required.

Responsible for the checking and approval of drawings.

Prepares and submits progress reports as required.

Experience Requirements:

One year experience required.

Good knowledge of either engineering physics, chemistry, mathematics, or related sciences sufficient to recognize a problem and solve it. Perform specialized research or production engineering and be able to compile reports and/or other data as required. Ability to carry out assigned duties with a moderate amount of supervision and instruction. Ability to direct the efforts of others in the completion of assigned duties.

Educational Requirements:

B.S. or equivalent in engineering physics, mathematics, or related sciences.

SUMMARY OF RESPONSES

ENGINEER (SCIENTIST, ETC.) EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.	6	2	0	0
E.E.+NO EXPERIENCE	2	3	2	2(3 years)
TECH.GRAD.+2-4 YRS.	0	3	0	4(3 years)
H.S.+4 YRS.	0	0	3	1(2 years)
H.S.+NO EXPERIENCE	0	0	1	1(2 years)

MANUFACTURING

MANUFACTURING

JUNIOR ENGINEER

Duties & Responsibilities:

As assigned and under direction and guidance, assists in the research of, or the design and development or production engineering of, a defined project usually involving a variety of engineering duties of a relatively simple nature.

Prepares reports as required, covering work performed.

Experience Requirements:

General knowledge of either engineering physics, mathematics, chemistry or related sciences for performing research, design or development or production engineering work of a simple nature.

Ability to carry out tasks of a simple nature under supervision and instruction.

Educational Requirements:

B.S. degree or equivalent in engineering, mathematics, chemistry, physics, or related science.

SUMMARY OF RESPONSES

JUNIOR ENGINEER EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.	7	0	0	0
E.E.+NO EXPERIENCE	3	6	0	0
TECH.GRAD.+2-4 YRS.	0	3	2	3 (3 years)
H.S.+4 YRS.	0	2	2	1 (2 years)
H.S.+NO EXPERIENCE	0	0	2	0

MANUFACTURING

MANUFACTURING

LABORATORY TECHNICIAN SPECIALIST

Duties & Responsibilities:

Plans and performs special laboratory work where highly developed skills and technical knowledge are required.

Supplies technical advice or guidance to others pertaining to his field of technical specialty.

Laboratory specialists will perform much of the work of a Senior Laboratory Technician; the difference is the degree of supervision and direction needed and the skill and knowledge required.

Experience Requirements:

Four years experience required.

Thorough knowledge in his technical field, sufficient to be recognized in company and local circles as an expert in his particular area of specialization.

Ability to work independently with a minimum of technical guidance; plan and perform the work within his field.

Ability to work with designs, processes, materials, structures, instruments, etc., used in or with existing or new techniques, models, or components.

Educational Requirements:

Two years of special technical training or equivalent.

SUMMARY OF RESPONSES

LABORATORY TECHNICIAN SPECIALIST EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E. +5 YRS. EXPER.				
E.E. +NO EXPERIENCE				
TECH. GRAD. +2-4 YRS.	4	1	1	2 (2 years)
H.S. +4 YRS.	3	1	4	1 (2 years)
H.S. +NO EXPERIENCE	1	2	0	3 (4 years)

MANUFACTURING

SENIOR LABORATORY TECHNICIAN

Duties & Responsibilities:

Conducts complex physical, mechanical, or electronic analyses, using engineering or scientific measuring equipment. Keeps detailed records of tests and submits data to superior.

Performs wiring, assembling, processing, expediting, and fabrication of electronic and mechanical equipment.

Performs other related laboratory tests as required.

Senior Laboratory Technicians will perform much of the work of a Laboratory Technician; the difference is the degree of responsibility assigned, the complexity of the tasks involved and the supervision required.

Experience Requirements:

Three years experience required.

Good working knowledge of the assembly and testing of engineering or scientific apparatus, assemblies or components to devise and set up test series, and be capable of organizing data.

Ability to carry out assignments with a moderate amount of instruction and direction.

Ability to intelligently interpret specifications, blueprints, and sketches.

Educational Requirements:

Two years special technical training or equivalent.

SUMMARY OF RESPONSES
SENIOR LABORATORY TECHNICIAN EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.				
E.E.+NO EXPERIENCE				
TECH.GRAD.+2-4 YRS.	3	3	1	0
H.S.+4 YRS.	1	3	4	0
H.S.+NO EXPERIENCE	1	0	1	4 (3 years)

MANUFACTURING

MANUFACTURING

LABORATORY TECHNICIAN

Duties & Responsibilities:

Conducts more complex physical, mechanical, or electronic analyses and tests, using engineering or scientific measuring equipment. Keeps detailed records of tests and submits data to superior.

Performs wiring, assembling, processing, expediting, and fabrication of electronic and mechanical equipment.

Makes test setups as directed and makes, repairs and adjusts equipment as needed. Responsible for general orderliness of assigned area and equipment.

Performs other related laboratory tasks as required.

Exerience Requirements:

Two years experience required.

Working knowledge of the assembly and testing of engineering or scientific apparatus, assemblies or components to devise and set up test series, and be capable of organizing data.

Ability to carry out assignments with a moderate amount of instruction and direction. Ability to interpret specifications, blueprints, and sketches.

Educational Requirements:

Two years special training or equivalent.

SUMMARY OF RESPONSES

LABORATORY TECHNICIAN EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.				
E.E.+NO EXPERIENCE				
TECH. GRAD.+2-4 YRS.	4	3	1	0
H.S.+4 YRS.	4	2	3	0
H.S.+NO EXPERIENCE	1	2	0	3 (3 years)

MANUFACTURING

MANUFACTURING

JUNIOR LABORATORY TECHNICIAN

Duties & Responsibilities:

Conducts routine and standard mechanical or electrical analyses and tests using engineering or scientific measuring equipment. Keeps detailed records of tests and submits data to superior.

Performs wiring, assembling, processing, expediting, and simple fabrication of parts and components of electronic and mechanical equipment.

Makes test setups as directed and makes repairs and adjusts equipment as needed.

Performs other related laboratory tasks as directed.

Experience Requirements:

Working knowledge of the assembly and routine testing of simple engineering or scientific apparatus, assemblies of components and be capable of compiling test data.

Ability to carry out simple assignments under direction and supervision.

Educational Requirements:

Two years technical training or equivalent.

SUMMARY OF RESPONSES
JUNIOR LABORATORY TECHNICIAN EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.				
E.E.+NO EXPERIENCE				
TECH.GRAD.+2-4 YRS.	7	0	0	0
H.S.+4 YRS.	5	4	0	0
H.S.+NO EXPERIENCE	2	0	4	1 (2 years)

MANUFACTURING

MANUFACTURING

DESIGN SPECIALIST

Duties & Responsibilities:

Plans and performs special design work where highly developed skills and technical knowledge are required.

Supplies technical advice or guidance to others pertaining to his field of technical speciality.

Performs special evaluations and feasibility studies of materials, components, processes, and techniques.

Consults with tool designers, production people and suppliers.

Design Specialists in this classification will perform much of the work of a Senior Designer; the difference is the degree of supervision and direction needed, the degree of responsibility assigned and the skill and knowledge required.

Experience Requirements:

Eight years experience required.

Thorough knowledge in his technical field sufficient to be recognized in company and local circles as an expert in his particular area of specialization.

Ability to work independently with a minimum of technical guidance; plan and perform the work within his/her field ability to work with designs, processes, materials, structures, instruments, etc., used in or with existing or new techniques.

Educational Requirements:

Two years technical or trade school or equivalent in mathematics, mechanical and electrical drawing.

SUMMAR. OF RESPONSES

DESIGN SPECIALIST EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.				
E.E.+NO EXPERIENCE				
TECH.GRAD.+2-4 YRS.	2	3	1	3 (3 years)
H.S.+4 YRS.	0	2	3	2 (3 years)
H.S.+NO EXPERIENCE	0	0	1	5 (4 years)

MANUFACTURING

MANUFACTURING

SENIOR DESIGNER

Duties & Responsibilities:

Makes or revises design layouts and collaborates in developing ideas evolved by engineers or scientists, using specifications, models and sketches and/or conceives complete design to perform a function previously outlined.

Assists engineers or scientists in solving mechanical or electrical problems connected with design and fabrication of equipment.

Responsible for the accuracy of final drawings. May delegate the completion of detailed drawings, production drawings, and specifications to draftsmen.

Assists in assembling components and parts into a working model; consults with tool designers, production people and suppliers.

Senior Designers in this classification will perform much of the work of a Designer; the difference is found in the degree of responsibility assigned and the supervision required.

Experience Requirements:

Six years experience required.

Working knowledge of mathematics and advanced mechanical and electrical drawing.

Good working knowledge of engineering and drafting practices, production processing and tools, sufficient to make or revise complex design drawings as applied to products involved.

Ability to direct the completion of complex design drawings.

Ability to use good judgement within limits of assigned responsibility.

Educational Requirements:

Two years technical or trade school education in mathematics, mechanical or electrical engineering.

SUMMARY OF RESPONSES

SENIOR DESIGNER EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.				
E.E.+NO EXPERIENCE				
TECH.GRAD.+2-4 YRS.	0	5	2	2 (3 years)
H.S.+4 YRS.	0	0	4	3 (2 years)
H.S.+NO EXPERIENCE	0	0	1	5 (3 years)

MANUFACTURING

MANUFACTURING

DESIGNER

Duties & Responsibilities:

Makes or revises design layouts and collaborates in developing ideas evolved by engineers or scientists, using specifications, models and sketches and/or conceives complete design to perform a function previously outlined.

Assists engineers or scientists in solving mechanical or electrical problems connected with design, and fabrication of equipment.

Responsible for the accuracy of final drawings. May delegate the completion of detailed drawings, production drawings and specifications to draftsmen.

Assists in assembling components and parts into a working model.

Performs other related duties as required, including those of a lower classification.

Experience Requirements:

4 years experience required.

Working knowledge of mathematics and advanced mechanical or electrical drawing.

Good working knowledge of engineering and drafting practices, production processes and tools, sufficient to make or revise design drawings as applied to products involved.

Ability to direct the completion of simple design drawings.

Education Requirements:

Two years technical or trade school education in mathematics, mechanical or electrical drawing.

SUMMARY OF RESPONSES
DESIGNER EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.				
E.E.+NO EXPERIENCE				
TECH.GRAD.+2-4 YRS.	3	3	2	1 (2 years)
H.S.+4 YRS.	1	3	2	1 (2 years)
H.S.+NO EXPERIENCE	0	0	2	4 (3 years)

MANUFACTURING

MANUFACTURING

SENIOR DRAFTSMAN

Duties & Responsibilities:

Makes drawings and sketches of varied phases of a project.

Makes layout of electrical and/or mechanical assemblies or sub-assemblies, using sketches and specifications previously determined.

Re-draws units as required by changes in specifications. May make highly complex detailed drawings or simple design drawings.

Coordinates related drawings and prepares them for detailed drawings.

Performs other related duties as required, including those of lower classification.

Experience Requirements:

At least 2 years experience in the same type of work including detailing.

Working knowledge of engineering and drafting practices, sufficient to make or change drawings; good knowledge of production tooling, tolerances and fits.

Educational Requirements:

One year technical or trade school or equivalent in mathematics and mechanical or electrical drawings.

SUMMARY OF RESPONSES

SENIOR DRAFTSMAN EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.				
E.E.+NO EXPERIENCE				
TECH.GRAD.+2-4 YRS.	5	2	0	0
H.S.+4 YRS.	2	4	1	2 (2 years)
H.S.+NO EXPERIENCE	0	0	4	2 (3 years)

MANUFACTURING

MANUFACTURING

DRAFTSMAN

Duties & Responsibilities:

Makes, traces, changes or completes complex detail drawings, outline diagrams of electronic and/or mechanical assemblies, freehand drawings, illustrations, wiring diagrams, schematics, block diagrams, interconnecting cable diagrams, etc. from sketches, layouts, assemblies, or verbal instructions. Work may include the coordinating of details among several drawings and the drawing of complete units from several drawings or sketches prepared by draftsmen. Makes details directly from layouts.

Draws charts of a statistical nature and posters for special occasions, as required. Performs other related duties as required, including those of a lower classification.

Experience Requirements:

1 year experience required.

Good working knowledge of engineering and drafting practices, sufficient to make, trace, change or complete complex detail drawings.

Good knowledge of production tooling, tolerances and fits.

Capable of developing sections of the design with little assistance.

Educational Requirements:

One year technical or trade school or equivalent in mathematics and mechanical or electrical drawing.

SUMMARY OF RESPONSES
DRAFTSMAN EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.				
E.E.+NO EXPERIENCE				
TECH.GRAD.+2-4 YRS.	6	2	0	0
H.S.+4 YRS.	5	2	1	1 (2 years)
H.S.+NO EXPERIENCE	0	2	2	2 (2 years)

MANUFACTURING

MANUFACTURING

JUNIOR DRAFTSMAN

Duties & Responsibilities:

Makes, traces or letters detail drawings, outlines, diagrams of electronic and/or mechanical assemblies, freehand drawings, illustrations, wiring diagrams, schematics, block diagrams, interconnecting cable diagrams, etc. from sketches and assembly drawings.

Performs other related duties in drafting department, as required.

Experience Requirements:

6 months experience required.

Working knowledge of drafting practices, sufficient to make or trace simple detail drawings.

Ability to carry out duties under close direction and supervision.

Educational Requirements:

One year technical or trade school or equivalent in mathematics and mechanical or electrical drawing, or graduate from a drafting training program.

SUMMARY OF RESPONSES

JUNIOR DRAFTSMAN EDUCATION REQUIREMENTS

CANDIDATE	6 WEEKS	6 MONTHS	1 YEAR	1 YEAR+
E.E.+5 YRS. EXPER.				
E.E.+NO EXPERIENCE				
TECH.GRAD.+2-4 YRS.	7	1	0	0
H.S.+4 YRS.	7	1	1	0
H.S.+NO EXPERIENCE	1	2	3	1 (2 years)

MANUFACTURING